

Fig 1: Identification System

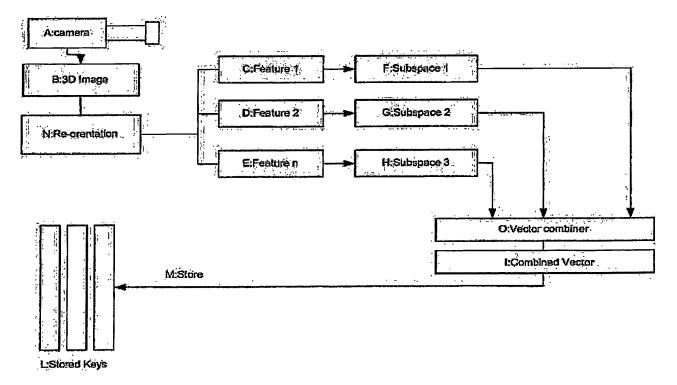


Fig 2 : Treining system

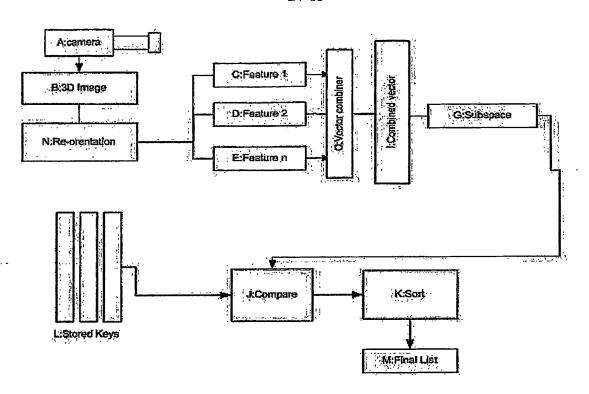


Fig3: Identification system using Combiner before the subspace method

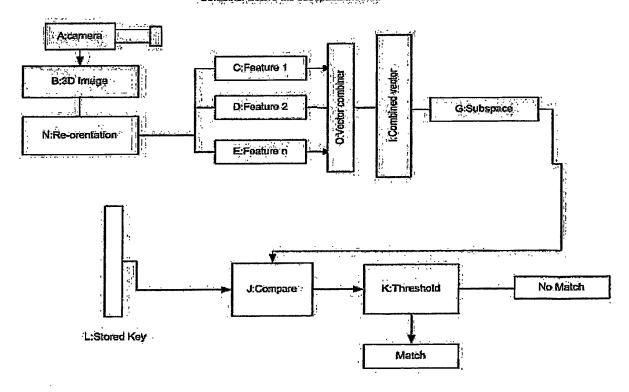


Fig 4: Verification system using Combiner before the subspace method

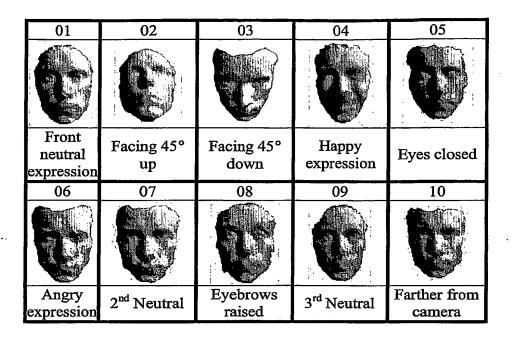


Fig. 5. Example face models taken from a 3D face database



Fig. 6. Orientation of a raw 3D face model (left) to a frontal pose (middle) and facial surface depth map (right)



Fig. 7. Average depth map (left most) and first eight eigensurfaces

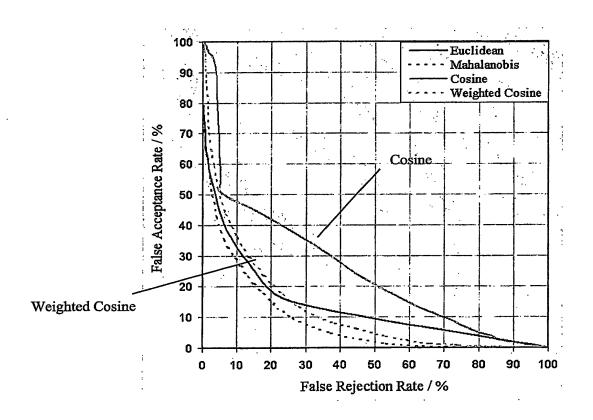


Fig. 8. Results from previous 3D face recognition systems using facial surface depth maps and a range of distance metrics

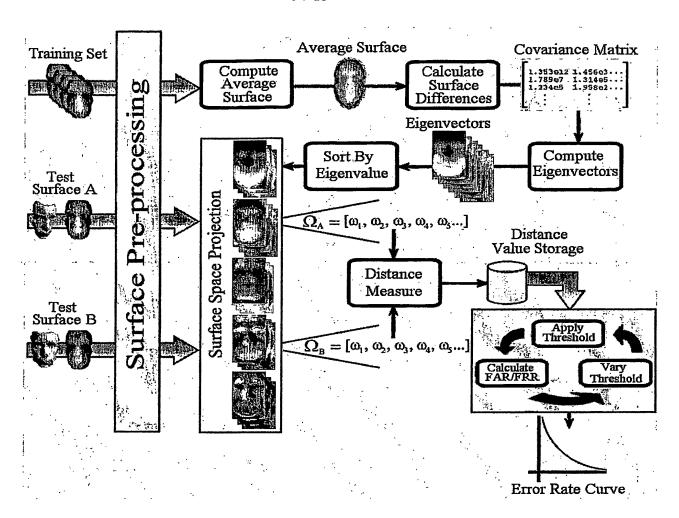


Fig. 9. Experimental framework for evaluating verification systems

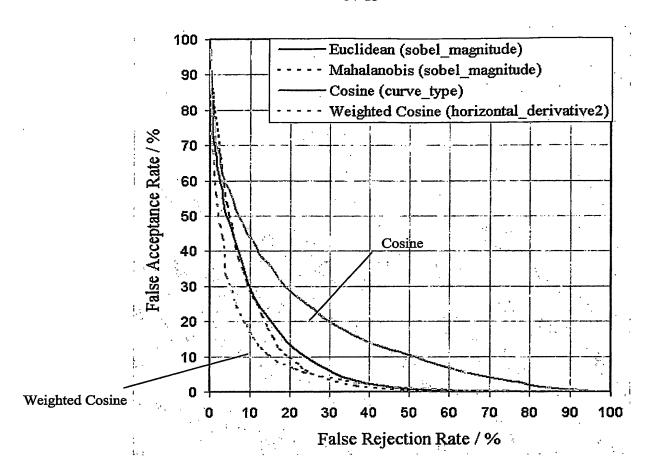


Fig. 10. Error rates of 3D face recognition systems using optimum surface representations and distance metrics.

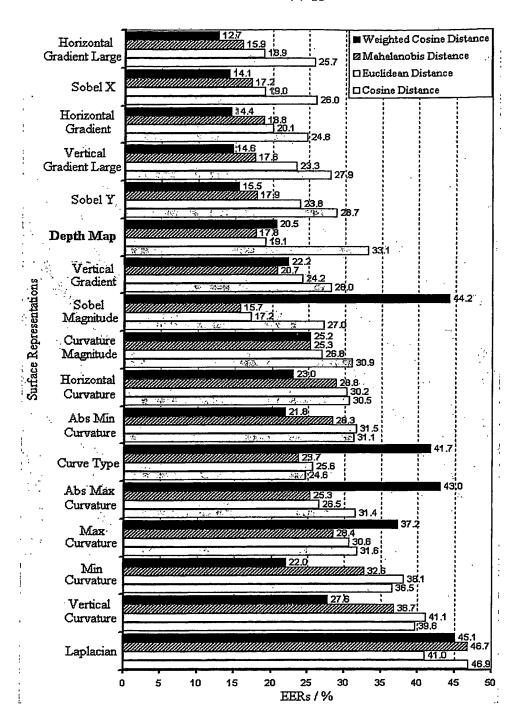


Fig. 11. Equal error rates of 3D face recognition systems using a variety of surface representations and distance metrics

Horizontal Gradient	Vertical Gradient	Horizontal Gradient Large	Vertical Gradient Large									
-1 1	-1 1	-10001	-1 0 0 0 1									
Applies the 2x1 kernel to compute the horizontal derivative	to compute the vertice derivative	Horizontal gradient calculated over a greater horizontal distance	Vertical gradient calculated over a greater vertical distance									
Laplacian	Sobel X	Sobel Y	Sobel Magnitude									
0 1 0 1-4 1 0 1 0	-1 0 -2 0 -1 0	2 000										
An isotropic measure of the second spatial derivative	Application of the sobel derivative filte in the horizontal direction	Application of the sobel derivative filter in the vertical direction	The magnitude of the X and Y sobel derivatives									
Horizontal Curvature	Vertical Curvature	Curvature Magnitude	Curve Type									
Applies the sobel X kernel twice to calculate the second horizontal derivative	Applies the sobel Y kernel twice to calculate the second vertical derivative	The magnitude of the vertical and horizontal curvatures	Segmentation of the surface into 8 discreet curvature types									
Min Curvature	Max Curvature	Abs Min Curvature	Abs Max Curvature									
The minimum of the horizontal and vertical curvature values	The maximum of the horizontal and vertical curvature values		The maximum of the absolute horizontal and vertical curvatures									

Figure 12. Brief descriptions of surface representations with the convolution kernels used.

Horizontal Derivative	Vertical Derivative	Horizontal Derivative 2	Vertical Derivative 2								
-1 1	-1 1	-10001	-1 0 0 0 0								
	Applies the 1x2 kernel		Vertical gradient over								
to compute the	to compute the vertical		a greater vertical								
horizontal derivative	derivative	horizontal distance	distance								
Laplacian	Sobel X	Sobel Y	Sobel Magnitude								
0 1 0 1-4 1 0 1 0	-1 0 1 -2 0 2 -1 0 1	1 2 1 0 0 0 -1 -2 -1									
An isotropic measure	Application of the	Application of the	The magnitude of								
of the second spatial	horizontal sobel	vertical sobel	Sobel X and Y								
derivative	derivative filter	derivative filter	combined.								
Horizontal Curvature	Vertical Curvature	Curvature Magnitude	Curve Type								
Applies sobel X twice	Applies sobel Y twice	The magnitude of the	Segmentation of the								
	to calculate the second		surface into 8 discreet								
horizontal derivative	vertical derivative	curvatures	curvature types								
Min Curvature	Max Curvature	Abs Min Curvature	Abs Max Curvature								
The minimum of the	The maximum of the	The minimum of the	The maximum of the								
horizontal and vertical		absolute horizontal and									
curvature values	curvature values	vertical curvatures	and vertical curvatures								

Fig. 13

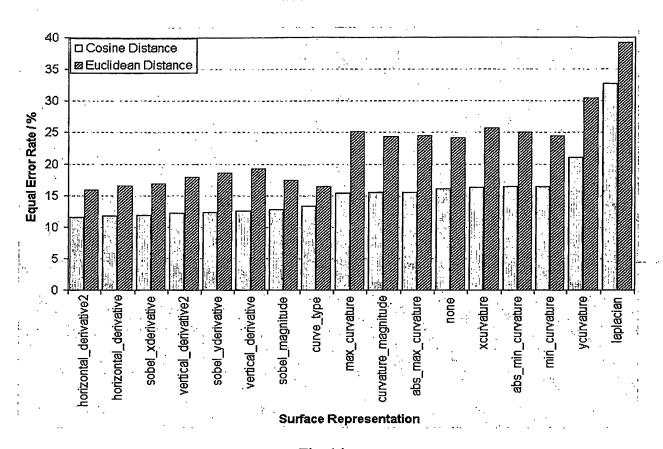


Fig. 14

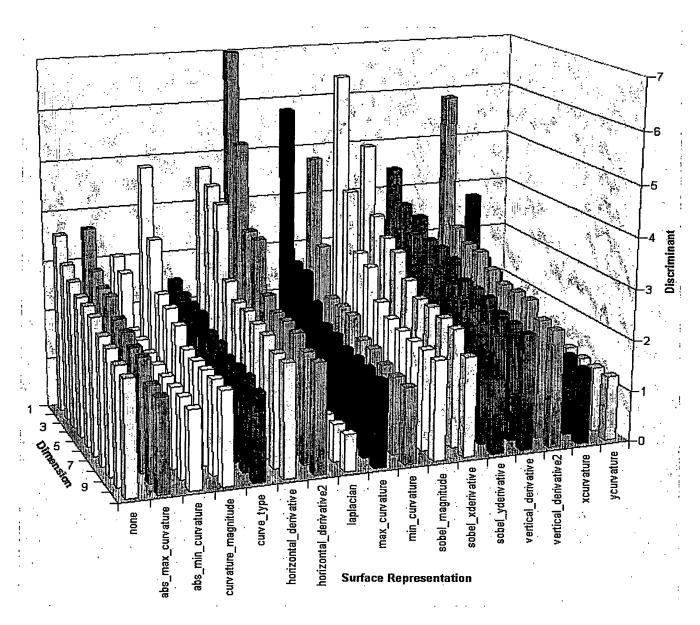


Fig. 15

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Fig. 16

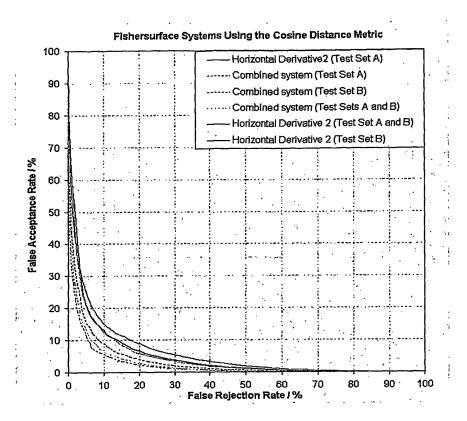


Fig. 17

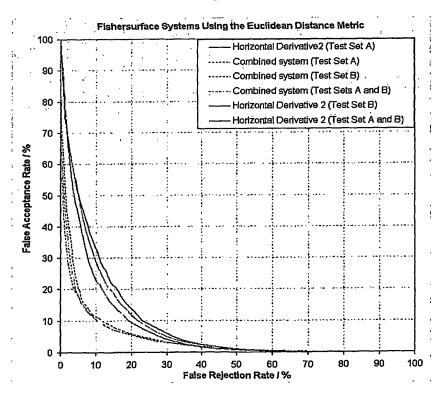


Fig. 18

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